Epidemiology in the era of globalization: skills transfer or new skills?

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Accepted 8 July 2003

Background Globalization carries information and technology opportunities and risks in widened inequalities, a resurgence of old health risks and reversal of health gains.

Methods The paper explores the implications for epidemiological work in southern Africa and through two case studies—occupational health and equity in health—profiles challenges faced in that region.

Results Occupational epidemiology is confronted by weak monitoring and regulatory systems, healthy worker effects, surveillance filters, and migration. Occupational disease determinants are masked by the combined effects of work, wider environmental risks, and high poverty-related disease. Health burdens associated with new production and trade patterns are thus largely unrecognized. Even when made visible, they may be ignored by economically vulnerable states and workers. Work on equity in health indicates the relevance of social and political determinants in the distribution of health resources. The shift of the cost burden of human immunodeficiency virus (HIV)/AIDS to poor communities and the weak public health response to HIV/AIDS suggest that economic and health reforms associated with globalization have both increased health inequalities and weakened social and political forces promoting equity and solidarity values in public health.

Conclusions Epidemiology can demystify disease sources and explain determinants in a manner that impacts on public policy and action. Under current conditions of globalization this implies addressing methodological challenges and enhancing uptake of evidence in policy processes. Given the intensifying political struggle around health resources, increased attention needs to be given to participatory forms of inquiry that strengthen the influence of poor communities and public interest values in health policy.

Keywords Epidemiological methods, globalization, southern Africa, health equity, occupational health

Globalization: winners and losers

In the past two decades global trade has tripled and trade in services has grown more than 14-fold. This has increased the production of information, knowledge, and technology. Not all are benefiting from this change, however: globalization under liberalized markets has generally benefited the strong industrialized economies and marginalized the weak. Average per capita gross national products (GNP) vary by a factor of about 12 between high and low income countries. Between 1960 and 1990 the poorest countries’ share of world trade fell from 4% to 1%. Debt consumes an increasing share of their scarce domestic resources, further reducing the possibility of development. These features of globalization have produced contrasting situations of opportunity and deprivation and widening inequalities in access to global resources. The income gap between the fifth of the world’s people living in the richest countries and the fifth in the poorest has increased to 74 to 1 in 1997, from 30 to 1 in 1960. This is the widest this gap has ever been. By the late 1990s the fifth of the world’s people living in...
the highest income countries had 86% of world GDP, 82% of the world export markets and 68% of foreign direct investment, while the bottom fifth had 1% of these parameters.

The assets of the top three billionaires in the world were more than the combined GNP of all least developed countries and their 600 million people.4

These inequalities also exist within regions and countries. A child born to a low income household in Mozambique has a ten times greater chance of dying before their first birthday than one born to a middle class family in neighbouring Zimbabwe. The same poor child has a significantly lower chance of having safe water supplies, a healthy diet, or access to health services for immunization or treatment of basic diseases than her wealthier counterpart.

Paradoxically, although growth in the transnational movement of capital, goods, and services has been associated with massive increases in information flow, knowledge, and new technologies, it has also introduced or intensified transborder health risks and widened social and economic inequalities within and between nations. In some regions these trends have been associated with a resurgence of old health risks and reversal of health gains.5–8

These conditions pose a number of challenges for epidemiologists, both in mapping disease, in studying the determinants of current patterns of ill health and in providing evidence for public policy. While information technology and intercontinental transport create the exciting impression of a global scientific village, the reality beyond the computer screen and the airport is vastly different in different parts of the world.

Two areas of epidemiological work in southern Africa are presented in this paper to profile some of the challenges faced in that region.

**Occupational health epidemiology in southern Africa**

Occupational health risks in southern Africa, as in other parts of Africa, have always been poorly monitored, studied, and documented. Historically colonial governments made insignificant investments in ensuring worker's health in the region, given the large pool of unemployed and landless labour and the possibility of sending ill workers back to rural areas without significant costs to companies. Huge groups of rural, farm, and informal sector workers were not covered by formal occupational health systems. Much occupational health epidemiology has thus been descriptive, documenting risk–disease relationships already well documented in industrialized countries, and in some cases long controlled or eliminated.9

While occupational health services began to improve post independence in many southern Africa countries, the public sector cutbacks and liberalized employment policies that accompanied market reforms weakened both the resources for and the policy commitment to these services. In the more industrialized countries of the region, changes in technology and in work organization have outpaced the systems for protecting workers' health. New chemical, electronic, and biotechnology industries and expanded service and transport sectors have introduced new risks, widened the spread of work-related risks, and increased their interaction with wider environmental risks, such as environmental pollution. Thus, in addition to old and prevalent problems, such as traumatic injury, respiratory disease, occupational dermatitis, and musculoskeletal injury, workers now suffer new forms of ill health, such as new asthmatic disorders, psychological stress, repetitive strain disorders, and other ergonomic-related injury. In sectors where export demand exists, work is characterized by a high level of demand, with little control over the nature and content of the work, leading to digestive disorders, sleep difficulties, and musculoskeletal problems.9–11 While there is some evidence of an association between increased intensity and reduced control of work and health problems, this is an area that merits further investigation, particularly in the setting of low quality, often unskilled jobs in southern Africa.

While in theory the changes in production present many opportunities for the measurement of occupational morbidity and for public policy intervention, in practice there are a number of barriers to both. Weak monitoring and regulatory systems imply that a significant share of occupational morbidity is not routinely reported, particularly chronic illnesses. Routine data systems suffer biases from healthy worker effects and surveillance filters. With insecure employment, particularly in small enterprises, chronic diseases are likely to go undetected and workers with severe disability will have dropped out of work. Many factors in the work environment that cause ill health modify, or are modifiers of, wider causes of ill health, such as the combined effects of workplace and environmental pollutants on asthmatic disorders. This makes it difficult to establish the direct contribution of the workplace, particularly for groups in which poverty has increased disease and mortality levels.

Production systems across the south have long used migrant workers, but increased trade and financial flows have added new waves of migrants, including informal sector traders. This poses a number of cross-border problems when trying to locate former migrant workers to measure or compensate illness and injury. A significant share of chronic occupational disease in migrant workers is likely to be undetected. Studies in Botswana and South Africa found, for example, thousands of undetected or unreported cases of occupational lung diseases in former mineworkers in the rural areas of southern Africa.12–14 These workers are absorbed back into poor rural communities, where their occupational disease is managed in poor households and underfunded public health systems.

These conditions indicate that a significant share of the health burdens associated with new production, trade, and employment patterns are likely to be unrecognized. Estimates of the burden of occupational disease suggest that reporting systems in southern Africa probably underestimate the real burden of occupational disease 50-fold.15,16 The fact that occupational illness is least visible in groups most marginalized from the opportunities of liberalized trade represents a silent shift of the burdens of economic reform. As noted above, that shift is often to public health services and poor households. Equally, weak regulatory systems and occupational health services imply that the burden of uncertainty about the adverse health risks of new production processes is usually borne by exposed workers. Low income countries have the least human, technical, and financial resources to carry out studies needed to demonstrate risk, a situation exacerbated by the outflow of occupational health professionals.
The expansion of knowledge and standards at global levels is thus poorly applied in those settings where risks are greatest. Rather than reversing this trend, globalization has been associated with economic policies that intensify it. Liberalization and trade competition between poor states has been associated with deregulation of production and health laws, such as in Export Processing Zones, weakening both the state systems and the strength of workers organizations that are necessary to ensure that risks are recognized and standards enforced. A net outflow of health personnel has weakened the occupational health expertise needed to identify new risks and health outcomes. Even when risk is ascertained, the results may be poorly applied in a context where states are vulnerable to investor pressures and workers subject to the threat of job insecurity. Workers themselves may be unwilling to expose employment patterns created by globalization.

What does this imply for occupational health epidemiology in southern Africa? On the one hand there are methodological challenges to deal with—issues such as control of bias due to migrancy, job insecurity, incomplete routine monitoring, and so on. There are also issues of scientific relevance: what research agenda, implemented in what manner, will drive healthy public policy under conditions of powerful transnationals, weak states, and undermined labour movements? This is discussed further in the last section.

### Epidemiology in the struggle for equity in health

Market reforms and liberalization have not only widened inequalities in health, but have also drawn resources away from health measures aimed at equity, risk pooling, and solidarity. Epidemiological work has contributed for over a century to the measurement of differentials in health. Such work has sought to bring public policy attention to unacceptable or avoidable inequalities, and thus promote new forms of public provisioning that reduce inequalities. Studies of health and health care differentials between social groups, such as that shown in Table 1 below, are used to highlight gaps between needs and services to enhance resource flow towards those with greater needs. Market reforms and global policy influences have complicated possibilities of such epidemiological work influencing health outcomes. As public health systems have become less well funded, greater attention has to be paid to influencing the wider range of determinants and policy areas influencing household health and wellbeing. Outside the health sector, health outcomes are a less persuasive motivator of policies on land, labour, and investment. Promoting health demands a widening awareness of the importance of health outcomes and of ensuring health sensitive policies in economic and trade sectors and in the labour, business, and professional communities within these sectors. This is equally necessary, but even more complex where the determinants of health outcomes lie outside national boundaries and where the work seeks to inform international or global policy.

To influence wider public policy, epidemiological work on inequalities has deepened its understanding of health determinants. Factors such as lack of integration into the community—such as occurs with single mothers and the elderly living alone without family support—family separation through labour migrancy, poor housing, racial or gender discrimination, and employment insecurity are measures of social deprivation that have been linked to poor health outcomes. These dimensions of deprivation have been associated with individual and household abilities to direct resources to address health needs. Social parameters such as cohesiveness, networking, and capabilities are, it is further suggested, proxies for more decisive determinants of health outcomes: the power relations that influence the distribution of societal resources.

The spread of the human immunodeficiency virus (HIV)/AIDS epidemic in southern Africa exemplifies the role of power relations in the transmission of disease. Studies show that the

### Table 1 Poor/richest ratios for selected health status indicators for selected Southern African Development Community countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Namibia</th>
<th>Malawi</th>
<th>Mozambique</th>
<th>Tanzania</th>
<th>Zambia</th>
<th>Zimbabwe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant mortality rate</td>
<td>1.11</td>
<td>1.33</td>
<td>1.98</td>
<td>1.37</td>
<td>1.77</td>
<td>1.25</td>
</tr>
<tr>
<td>Under 5 years mortality rate</td>
<td>1.46</td>
<td>1.47</td>
<td>1.92</td>
<td>1.44</td>
<td>1.57</td>
<td>1.50</td>
</tr>
<tr>
<td>% children &lt;5 years stunted</td>
<td>2.19</td>
<td>1.53</td>
<td>2.19</td>
<td>1.75</td>
<td>2.08</td>
<td>1.93</td>
</tr>
<tr>
<td>% children under 5 years underweight</td>
<td>2.83</td>
<td>1.96</td>
<td>2.58</td>
<td>2.19</td>
<td>2.45</td>
<td>2.04</td>
</tr>
<tr>
<td>Total fertility rate</td>
<td>1.92</td>
<td>1.18</td>
<td>1.18</td>
<td>2.00</td>
<td>1.68</td>
<td>2.21</td>
</tr>
<tr>
<td>% children under 1 year with all immunizations</td>
<td>0.85</td>
<td>0.82</td>
<td>0.23</td>
<td>0.70</td>
<td>0.83</td>
<td>0.84</td>
</tr>
<tr>
<td>% acute respiratory infection cases seen at a public health facility</td>
<td>1.03</td>
<td>0.73</td>
<td>0.38</td>
<td>0.79</td>
<td>1.20</td>
<td>0.91</td>
</tr>
<tr>
<td>% deliveries attended by a medically qualified person</td>
<td>0.56</td>
<td>0.57</td>
<td>0.22</td>
<td>0.33</td>
<td>0.21</td>
<td>0.59</td>
</tr>
<tr>
<td>% women knowing a method of HIV prevention</td>
<td>na</td>
<td>0.90</td>
<td>0.65</td>
<td>0.60</td>
<td>0.81</td>
<td>0.77</td>
</tr>
</tbody>
</table>

(Note: The figures in the Table show for each indicator the ratio of the rate for the poorest quintile to the rate for the richest quintile in the selected indicator.)

* Human immunodeficiency virus.
HIV epidemic has spread from more socially and economically powerful adult males to poor and economically insecure females, particularly female adolescents.\textsuperscript{27–30} Disease risks from such power relations have been reinforced by social and economic conditions. Transmission of HIV/AIDS has been more rapid where people move for trade, work, food, and social support. Hence areas of migrant employment, transport routes, and urban and peri-urban areas have been high risk environments for HIV, especially in the presence of poor communities and economically insecure women.

The same power relations influence the distribution of resources to manage HIV/AIDS. The impact of AIDS on the poorest groups has been to precipitate them deeper into poverty, and to facilitate the intergenerational transmission of poverty.\textsuperscript{31} Responding to this calls for a level of public expenditure on health, housing, production, and other areas of support that has not been provided nor channelled to poor communities from either a national or a global level.

Instead, the costs of AIDS have been shifted to household level. While HIV/AIDS was estimated to cost economies about 1% of GDP annually, research has shown that it has in fact had a small and statistically insignificant negative impact on such macroeconomic indicators (e.g. growth rates, \textit{per capita} income). The impacts have been found to be least visible at the macroeconomic level and most visible at household level, where AIDS can lead to chronic and potentially inter-generational poverty.\textsuperscript{31} Death, disability, and medical insurance schemes have excluded people with HIV or reduced benefits, reducing coverage and household savings and shifting the costs of unsecured risks to public and household budgets. Health services have promoted home-based care approaches that have often been inadequately supported, further stressing households, and particularly women caregivers.\textsuperscript{32}

These case studies suggest that macroeconomic and health sector reforms associated with globalization have not only increased inequalities in health, they have also enabled more powerful business, medical, and wealthy interest groups to exact health sector concessions at the cost of the poorer, less-organized rural health workers, or the urban and rural poor.\textsuperscript{33–37} The benefits of globalization—information exchange, cross border resource flows, international norms—appear to have been largely inaccessible to poor communities and weakly used to drive the values of equity and solidarity needed to build effective public health systems.

Epidemiology has always been an important scientific tool for public health. Can epidemiological work motivate healthy public policy under globalization? Can epidemiology be used as a tool to intervene in the power relations and socioeconomic factors that drive the downward transmission of the costs of disease to poor individuals, households and communities?

Implications for the science and practice of epidemiology

This seems a somewhat ambitious agenda. At the same time, there is nothing small about globalization. It represents a sweeping transformation of all spheres of life in a way that cannot be ignored and must be engaged.

Today’s globalization has been criticized for being driven by the mechanisms, standards, rules, interests, and institutions for expanding markets and the movement of capital, outpacing the policies, rules, interests, and institutions needed for social protection. The two case study areas above indicate that poor communities, poor countries, and areas of human development provided outside markets, such as education and health, have suffered.

Epidemiology as a science played a critical role in the industrial revolution of the early 1800s in demystifying the sources of disease and explaining their relationship to basic issues of housing, nutrition, safe water, and sanitation. This understanding was used in the demands for improved diets and living standards and the expansion of public health in the early 1900s. Can epidemiology play a similar role in this current economic transformation? Can current work in epidemiology be as powerful as the work of William Budd, John Sutherland, and John Snow on water-related disease to drive public policy and health intervention at global and national level?\textsuperscript{38}

There is evidence throughout the last century that epidemiological work has the potential to provide a powerful explanatory tool of the forces underlying the human condition, and to provide public and credible explanation in a manner that impacts on public policy and action. The power of such work derives from a blend of the research agenda, research methods and constituencies involved.

The southern Africa case studies highlight a range of methodological challenges in mapping the determinants of health outcomes under current social and economic conditions, given the manner in which economic trends have fragmented, disrupted and moved vulnerable communities. As shown across both public and occupational health, epidemiological skills are needed to design studies that demonstrate the political, social, and economic determinants of ill health, in an environment of overlapping work-related, environmental, social, and individual risks, weak, collapsing, or absent monitoring systems, and fallout from studies due to migration, and marginalization.

Beyond addressing such methodological issues, epidemiologists need to enhance the uptake of evidence in policy processes, to cross the gap between existing knowledge and its implementation. This implies a closer link between research and policy in setting the research agenda and using research findings. If the gap is traced to political forces, then work aimed at influencing public policy needs to understand those forces and at times subject them to scientific and public scrutiny as determinants of health outcomes.

The knowledge to practice gap can also be conceptualized as an arena of social struggle, where rights and entitlements are shaped, negotiated, claimed, and resisted. In this case the choice of research agenda, the knowledge generated, and even the methods used are not neutral to that struggle.

Given the intensifying political struggle around scarce health resources, epidemiological work that places the populations affected in a passive role, affected by inputs and reflecting outcomes, ignores the social forces that drive policy choices. As Sen puts it ‘Issues of social allocation of economic resources cannot be separated from the role of participatory politics and the reach of informed public discussion’.\textsuperscript{39} This has led to greater focus in epidemiological studies of the role of ‘social capital’, procedural justice and participation in health outcomes, and exploration through epidemiological studies of the extent
to which social norms and networks are themselves associated with positive health outcomes.\textsuperscript{40–42}

Equally important, however, are approaches to research that enable more direct participation by those affected, such as participatory and action research methods. This is argued to put those involved in a stronger position to take informed decisions on health issues.

Such work has relevance to both the occupational and public health case studies described earlier. The increased complexity of working life, the need to access shopfloor knowledge of work and organizational processes, increased emphasis on stress and other subjectively experienced conditions, the increasing recognition of multifactorial illness, and the need to determine illness in early stages has motivated a greater recognition of the experience and involvement of workers as central to their health.\textsuperscript{47} Dealing with HIV/AIDS has generated processes of inquiry that recognize and organize the knowledge of ordinary people, challenging the kind of ‘expert knowledge’ that suppresses or marginalizes as unimportant this experience.\textsuperscript{46} Social mapping and participatory research has been used in southern Africa, for example, to enable adolescents, commercial sex workers, and other vulnerable groups to understand and act on the sources and determinants of risk of HIV/AIDS. Participatory research methods have been used to enable poor communities to map equity in resource allocations for health, towards organizing claims for a greater share of public health resources.

While demanding and often not well understood by the scientific community, participatory approaches have the possibility of making a more direct connection with the public actors and political forces that shape public policy.

The Workers Model (WM) in Italy was one important example of such a process of inquiry in occupational health. The hazards of the work environment in this approach are organized into risk groups that correspond to workers’ experience and perception of the work environment. ‘Homogenous groups’ of workers sharing the same working conditions identified health outcomes associated with particular risk groups. The collective agreement within a group on risk–health relationships (consensual validation) was used to build collective understanding of priorities for change and of strategies to achieve this.\textsuperscript{47} These studies created a widespread consciousness about the importance of work for health that significantly influenced Italian public health policy and institutions in the 1970s.\textsuperscript{47} They were documented in a large body of new literature on work–health relationships. More significantly they gave unions and workers greater control over the results of their own occupational health institutions, expanded the areas of local and national collective bargaining agreements to include health issues, and motivated changes in labour legislation and in working conditions. The combined effect of these changes contributed to a decline in work-related health problems and work accidents.\textsuperscript{48,49} They stimulated participatory research on occupational health in Latin America and in Africa.\textsuperscript{49–51}

In Sweden, close co-operation between researchers and trade unions led to participatory ‘working life research’, both in the work of a group of scientists led by Bertil Gardell and supported by the Swedish trade unions and Work Environment Fund and in the Swedish trade union surveys of work environments.\textsuperscript{52,53} Gardell’s group was motivated by a broadened concept of health and safety linked to the democratization of working life. They carried out action research that demonstrated that machine pacing, isolation, piece rate pay, and authoritarian management systems had negative social and psychological consequences for working people and that led to action research on technological and organizational changes towards improved working life. This work inspired later surveys, carried out in the 1970s under the control of the Swedish trade unions, to raise the profile of workers perceptions of occupational health risks in national negotiations on working environments.\textsuperscript{52,53}

Analysis of these experiences of participatory inquiry in occupational health has demonstrated features that signal the potential for participatory research to contribute to closing the research to policy gap through raising the social visibility of worker and community health experience; producing new evidence on risk–health relationships; motivating new areas of scientific inquiry; facilitating control over information in the social groups affected by health problems, and strengthening their ability to negotiate and claim health entitlements.\textsuperscript{54} An analysis of different experiences of participatory approaches to occupational health research indicate that these approaches can particularly contribute to new knowledge where existing knowledge is seriously limited or biased or where researchers lack access to workplaces,\textsuperscript{54} such as those found in the poorly monitored, poorly regulated work environments described earlier in southern Africa.

Historical experience and scientific evidence from occupational health work signals the potential value of participatory methods in exploring the health risks in globalization, particularly in low income countries. It would be important to similarly systematize the contribution of such approaches in dealing with other public health challenges under globalization as part of the epidemiology agenda for the future.

Given the extent to which the burden of disease and the costs of disease in poor communities are growing, there is demand for powerful scientific tools to drive healthy public policy. While of necessity these need to generate new knowledge, they should also be used to understand, make visible and confront the power relations and public policies that undermine the application of that knowledge in communities with greatest health needs.

Epidemiology as a process of scientific inquiry holds the potential of having great relevance to this scientific challenge. Studying the distribution and determinants of disease has in the past and continues to offer unique opportunities for strengthening public policies so that they direct resources more equitably towards public health goals.

Epidemiological studies can generate new knowledge that reveals the health costs of marginalization, insecurity, and unsustainable development paths. Such studies send an important warning signal of a need for change.

In recent decades new forms of epidemiological inquiry have emerged that give greater force to that knowledge. Studies that generate understanding and make visible the power relations and policies that undermine public health goals give direction to such change. Studies that generate knowledge in ways that directly empower those who have an interest in achieving public health goals yield greater possibilities of that change being effected.
KEY MESSAGES

- Globalization carries health risks and burdens that are largely unrecognized and unmonitored in low income communities.
- Economic and health reforms associated with globalization have increased health inequalities and weakened social and political forces in public health.
- Epidemiology faces challenges under these conditions that are both methodological and political.
- Participatory forms of inquiry can contribute to strengthening the influence of poor communities and public interest evidence and values in health policy.

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